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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **EE252/ 11EE211/12EE211** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **ELECTRICAL MACHINE DESIGN** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | What are the main dimensions of a rotating machine? | (1) |
| 2. | What is leakage co-efficient? | (1) |
| 3. | What factor decides the minimum no. of armature coils? | (1) |
| 4. | Why square pole is preferred? | (1) |
| 5. | What are the advantages of using higher flux density in the core? | (1) |
| 6. | State different losses in a transformer. | (1) |
| 7. | What are the factors to be considered for the choice of specific magnetic loading? | (1) |
| 8. | What are the methods to reduce harmonic torques? | (1) |
| 9. | Name the two types of synchronous machines. | (1) |
| 10. | What is runaway speed? | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | What is real and apparent flux density? | (3) |
| 12 | What is the effect of inter pole on main pole? | (3) |
| 13 | What are the advantages of three phase transformers over single phase transformers? | (3) |
| 14 | What is full pitch and short pitch or chording? | (3) |
| 15 | What is short circuit Ratio (SCR)? | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | Derive the Output equation of a DC Machine. | (6) |
| b. | A 20HP, 440V, 4 pole, 50Hz, three phase induction motor is built with a stator bore of 0.25m and core length of 0.16m. The specific electric loading is 23000 ampere conductors per metre. Find the specific magnetic loading of the machine. Assume full load efficiency of 84% and a power factor of 0.82. Using the data of the above machine, determine the main dimensio9ns for a 15HP, 460V, 6 pole, 50Hz motor. | (9) |
| (OR) | | | |
| 17. | a. | A 15kW, 230V, 4 Poles DC Machine has the following data: armature diameter = 0.25m  armature core length = 0.125m, length of air gap at pole centre = 2.5mm, flux per pole= 11.7mwb, Calculate the mmf required for air gap (i) if the armature surface is treated as smooth (ii) if the armature surface is slotted and the gap contraction factor is 1.18. | (8) |
| b. | Find the permeability at the root of the teeth of a DC machine armature from the following data: slot pitch = 2.1cm, tooth width at the root = 1.07cm, gross length = 32cm, stacking factor = 0.9, real flux density at the root of the teeth = 2.25 tesla, apparent flux density at the root = 2.36 tesla. | (7) |
| 18. |  | A 4 pole, 25HP, 500V, 600rpm series motor has an efficiency of 82%. The pole faces are square and the ratio of pole arc to pole pitch is 0.67. Take Bav = 0.55wb/m2 and ac = 17000 ampere conductors/m. Obtain the main dimensions of the core and particulars of a suitable armature winding. | (15) |
| (OR) | | | |
| 19. |  | The following particulars refer to the shunt field coil for a 440V, 6 pole, DC generator. MMF per pole = 7200A, depth of winding = 50mm, length of inner turn = 1.1m, length of outer turn = 1.4m, loss radiated from outer surface excluding ends = 1400W/m2, space factor = 0.62, resistivity = 0.02Ω/m and mm2. Calculate (a) diameter of wire (b) length of coil (c) number of turns and (d) exciting current. Assume a voltage drop of 15% of terminal voltage across the field regulator. | (15) |
| 20. |  | Calculate the dimensions of the core, the number of turns and cross sectional area of conductors in the primary and secondary windings of a 100kVA, 2200/480V, 50Hz, single phase core type transformer. Approximate volt/turn = 7.5V. Maximum flux density = 1.2wb/m2. Ratio of effective cross-sectional area of core to square of diameter of circumscribing circle is 0.6. Ratio of height to width of the window is 2. Window space factor is 0.28. Current density = 2.5A/mm2. | (15) |
| (OR) | | | |
| 21. |  | A 250kVA, 6600/400V, three phase core type transformer has a total loss of 4800W at full load. The transformer is 1.25m in height and 1mX0.5m in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 350C. The diameter of tubes is 50mm and is spaced 75mm from each other. The average height of tubes is 1.05m. The specific heat dissipation from the tank walls is 6W/m2-°C and 6.5W/m2-°C due to radiation and convection respectively. Assume that the convection is improved by 35% due to convection. | (15) |
| 22. |  | Determine the main dimensions, number of stator slots and the number of turns per phase of a 100kW, 3300V, three phase, 12 pole, 50Hz star connected slip ring with average flux density in the gap = 0.4wb/m2, ampere conductors per metre = 25000, efficiency = 0.9, power factor = 0.9. Choose the main dimensions to give best power factor. The slot loading should not exceed 500amp conductors. | (15) |
| (OR) | | | |
| 23. |  | A 90kW, 500V, 50Hz, 8 poles Induction motor has a star connected stator windings accommodated in 63 slots with 6 conductors per slot. If the slip ring voltage on open circuit is to be about 400V, Assume efficiency = 0.9 and power factor = 0.86, Design a suitable rotor winding. | (15) |
| 24. |  | Estimate the diameter, core length, size and number of conductors, number of slots for stator of a 15MVA, 11kV, 50Hz, 2 pole star connected turbo alternator with 60° phase spread. Assume: Bav = 0.55wb/m2, ac = 30000Ampere conductors/m. if the peripheral speed exceed 100m/sec and the ratio of pole pitch to core length is to be between 0.6 and 1, find the D and L. Assume an air gap length of 6mm. Find the approximate number of stator conductors. | (15) |
| (OR) | | | |
| 25. |  | Determine (i) air gap diameter (ii) core length (iii) number of stator conductors (iv) number of stator slots (v) cross section of stator conductors for a 250kVA, 1100V, 12 poles, 500rpm, three phase alternator with average flux density of 0.6wb/m2 and specific electric loading of 30000ampere conductors/m and L/τ = 1.5. | (15) |

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